

Charlotte, N. C., 23d: frost is reported from the surrounding country. Some cotton is reported killed by it.

Columbus, Bartholomew Co., Ind., 24th: a heavy frost occurred here last night, which did considerable damage to fruit and vegetables. The wheat, which is heading out, is somewhat injured.—*Oswego, N. Y., Daily Times, May 24.*

Wabash, Ind.: great damage was done to the corn and potato crops in this vicinity by the freeze during the night of the 22-23d. The corn plants are brown and withered, and the crop will be cut short, if replanting to a large extent may not be required. The weather is the coldest ever known at this season.—*Rochester, N. Y., Democrat and Chronicle, May 25.*

Marquette, Mich., 25th: heavy frost occurred during the night, causing some damage to vegetation.

Dover, Strafford Co., N. H., 27th: there was a heavy frost in this vicinity yesterday morning, doing great damage to crops.—*Rochester, N. Y., Union and Advertiser, May 27.*

Detroit, Mich.: reports from Holland, Pontiac, Cadillac, Battle Creek, and Galesburgh, Mich., state that a very damaging frost occurred on the morning of the 28th. Corn, fruit, and garden vegetables were killed, and potatoes, clover, wheat, and rye seriously injured. Much of the corn will have to be replanted. Ice formed in places one-half inch thick.—*Detroit Tribune, May 29.*

Milwaukee, Wis., 28th: reports from Plymouth, Oshkosh, Ellsworth, Delavan, Fort Atkinson, and Palmyra, Wis., show that the frost which occurred during the morning was very destructive to small fruit, corn, garden vegetables, etc. The frost-bitten section is quite wide-spread.—*The (Milwaukee) Evening Wisconsin, May 28.*

Alpena, Mich.: frost on the mornings of the 28th and 29th did considerable damage to vegetation, trees, and garden truck.

Jamestown, Chautauqua Co., N. Y., 29th: frost did immense damage in western New York and northern Pennsylvania last night. Reports show that the damage to grass, wheat, potatoes, flowers, and vegetables is inestimable. Farmers have already commenced replanting such crops as will have time to mature.—*Cleveland Reader and Herald, May 30.*

Rochester, N. Y., 29th: reports from Medina, Chili Station, Warsaw, North Cohocton, Mount Morris, Buffalo, and Albany, N. Y., state that the frost of last night caused much damage to early crops at those places. Fruit also suffered severely.—*Rochester, N. Y., Post Express, May 29.*

Erie, Pa.: the frost on the morning of the 29th injured vegetation seriously.

Memphis, Tenn.: the frost which occurred on the morning of the 31st was general throughout this section, and will prove disastrous to young cotton in the lowlands.

Saint Paul, Minn.: reports show that the frost during the last four days of the month was general and very destructive throughout the state. All tender plants were ruined; corn was badly hurt, and, in some places, even oats and wheat showed the effects of it.

Milwaukee, Wis., 31st: frosts and cold weather during the month have caused slight damage in this vicinity to strawberries, vegetables, etc. In the interior and northern portions of the state the damage was considerable, and will necessitate the replanting of corn, tobacco, and other crops in many places.

LIMITS OF FREEZING WEATHER.

The southern and western limits of freezing weather for May, 1889, are shown on chart ii. A line representing the southern limit is traced from north-central New England south of west over the lower lakes to southern Michigan, and thence northwestward to Duluth, Minn., where it recurves southwestward to southwestern New Mexico. A line showing the western limit of freezing weather is traced from east-central Arizona northwestward to southwest Oregon where it curves to the east and southeast over northwestern Utah, and is thence continued northward over western Montana into the British Possessions.

As compared with the preceding month the southern limit of freezing weather east of the Missouri Valley averages about 5° further north; in New Mexico and Arizona it is about the same; while over the plateau regions, north of the fortieth parallel, the western limit is about 5° further east.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for May, 1889, as determined from the reports of over 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

In May, 1889, the precipitation was greatest from central Pennsylvania southward to central Virginia, where it generally exceeded ten inches, the greatest depth of rainfall in that section, 12.41 inches, being reported at McConnellsburgh, Pa.; in west-central Illinois, 10.63 inches were recorded for White Hall; in central Missouri, along the Missouri River, 14.35 inches fell at New Frankford; in east-central Kansas 12.14 inches fell at Lebo, and at one station, Crescent City, in the extreme northwest part of California, 10.91 inches were reported. The smallest precipitation east of the Rocky Mountains was reported at Cedar Keys, Fla., where the total rainfall for the month was less than 0.01 of an inch, and at stations in the Rio Grande Valley and northeastern Dakota, where less than one-half inch fell. In the Rocky Mountain and plateau regions the rainfall exceeded three inches at stations in central Colorado and northern Montana, and in adjoining parts of western Oregon and Washington Territory the total precipitation for the month exceeded four inches. At a ma-

jority of stations in Arizona, south of the thirty-fifth parallel, and in adjoining parts of California and New Mexico no rainfall was reported. Along the Pacific coast the precipitation for the month varied from ten inches, or more, on the extreme northern coast of California, to less than two inches in northern Washington Ter., and to 0.03 of an inch at San Diego, Cal.

The precipitation for May, 1889, generally averaged above the normal in districts lying north of the thirty-fifth parallel, except from the Missouri valley southward to northern Texas, in Maine, the Canadian Maritime Provinces, the Saint Lawrence valley, the eastern lower lake and the northern upper lake regions, northern Wisconsin, and Minnesota, where it was deficient. Over a greater portion of the country lying south of the thirty-fifth parallel the precipitation was below the normal. The greatest departures above the normal occurred in the middle Atlantic states, the most marked excess, 7.21 inches, being noted at Washington, D. C. In the Missouri Valley, embracing portions of Missouri and Kansas, the total for the month exceeded the normal by more than four inches; in the southeastern part of Washington Territory by more than three inches; on the southeast coast of New England, and in the Sacramento Valley, California, by more than two inches. The greatest departures below the normal occurred over the northern extremity of Texas, and in the extreme southern part of the Mississippi Valley, where they amounted to more than four inches. At stations in the Missouri Valley, along the west Gulf and a part of the south Atlantic and Florida coasts the rainfall for the month was three inches, or more, below the normal, while in adjoin-

ing parts of Maine and New Brunswick and on the east Gulf coast the deficiencies exceeded two inches.

In districts where the precipitation was in excess the average percentages above the normal were about as follows: New England, 10 per cent.; middle Atlantic states, 52 per cent.; Ohio valley and Tennessee, 11 per cent.; lower lake region, 5 per cent.; upper lake region, 4 per cent.; upper Mississippi valley, 3 per cent.; extreme Northwest, 7 per cent.; north-eastern slope of the Rocky Mountains, 26 per cent.; northern plateau region, 94 per cent.; middle plateau region, 33 per cent.; north Pacific coast, 4 per cent.; middle Pacific coast, 251 per cent. In districts where the precipitation was below the normal the percentages of the normal precipitation were about as follows: South Atlantic states, 62 per cent.; Florida, 18 per cent.; east Gulf states, 44 per cent.; west Gulf states, 55 per cent.; Rio Grande Valley, 21 per cent.; southeastern slope of the Rocky Mountains, 84 per cent.; middle eastern slope of the Rocky Mountains, 61 per cent.; southern plateau region, 6 per cent.; south Pacific coast, 87 per cent.

Among noteworthy features of the precipitation of the month were the excessive rainfall on the middle Pacific coast, where about three and one-half times the usual amount for May fell, and where in the preceding month only about one-half of the normal precipitation for April was recorded; the heavy rainfall in the middle Atlantic states, where the precipitation was about 50 per cent. in excess of the May average, and where for the preceding month nearly double the usual amount for April fell; the great deficiency in rainfall in the southern plateau region, where but about 6 per cent. of the normal amount was reported, and where in the preceding month only about one-third of the normal amount for April was reported; the marked deficiency in the Rio Grande Valley, where about one-fifth of the normal rainfall for May occurred, and where in the preceding month there was an excess of about 250 per cent. The deficiency in rainfall for Florida, the east and west Gulf states for April, 1889, continues, the amount noted for the current month in Florida being but about one-fifth of the normal for May.

A discussion of the remarkable rainfall and floods in sections of the middle states appears in this REVIEW, and a comparison of excessive monthly, daily, and hourly rainfalls with those for the corresponding month of previous years is given under the heading "Excessive Precipitation."

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for May, 1889; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for May during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of May.	(2) Length of record.	(3) Total for May, 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for May.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Arkansas.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Lead Hill.....	Boone.....	6.85	7	5.32	-1.53	10.56	1882	2.04	1886
<i>California.</i>									
Sacramento.....	Sacramento.....	0.65	39	3.65	+3.00	3.65	1889	0.00	1857
<i>Colorado.</i>									
Fort Lyon.....	Bent.....	1.97	19	1.09	-0.88	4.84	1867	0.14	1868
<i>Connecticut.</i>									
Middletown.....	Middlesex.....	3.81	27	3.33	-0.48	7.63	1868	0.22	1887
<i>Florida.</i>									
Merritt's Island.....	Brevard.....	3.87	12	1.30	-2.57	8.71	1879	0.88	1886
<i>Georgia.</i>									
Forsyth.....	Monroe.....	2.98	15	1.98	-1.00	6.47	1885	0.45	1877
<i>Illinois.</i>									
Peoria.....	Peoria.....	3.79	33	3.92	+0.13	10.73	1858	0.93	1879
Riley.....	McHenry.....	3.78	38	4.09	+0.31	15.46	1851	0.54	1870
<i>Indiana.</i>									
Logansport.....	Cass.....	4.77	16	6.51	+1.74	11.13	1858	2.09	1881
Vevay.....	Switzerland.....	3.82	24	6.17	+2.35	11.80	1865	0.52	1874

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of May.	(2) Length of record.	(3) Total for May, 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for May.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Iowa.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Cresco.....	Howard.....	3.47	17	4.18	+0.71	7.89	1880	0.76	1874
Monticello.....	Jones.....	3.57	34	4.56	+0.99	7.97	1858	0.76	1874
Logan.....	Harrison.....	4.46	23	3.28	-1.18	11.00	1877	1.10	1874
<i>Kansas.</i>									
Lawrence.....	Douglas.....	4.07	23	8.27	+4.20	8.27	1889	1.12	1887
Wellington.....	Sumner.....	4.89	10	3.29	-1.60	9.37	1881	0.88	1886
<i>Louisiana.</i>									
Grand Coteau.....	St. Landry.....	6.75	6	0.21	-6.54	14.03	1884	0.21	1889
<i>Maine.</i>									
Gardiner.....	Kennebec.....	3.72	50	2.54	-1.18	11.76	1850	0.36	1852
<i>Maryland.</i>									
Cumberland.....	Allegany.....	2.82	17	7.02	+4.20	7.02	1889	0.30	1875
<i>Massachusetts.</i>									
Amherst.....	Hampshire.....	3.87	53	4.18	+0.31	8.72	1850	0.75	1887
Newburyport.....	Essex.....	3.67	10	4.13	+0.46	5.58	1888	1.19	1880
Bomerset.....	Bristol.....	3.45	16	5.79	+2.34	5.79	1889	1.08	1880
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo.....	4.04	13	4.86	+0.82	6.38	1883	1.44	1885
Thornville.....	Lapeer.....	3.30	12	4.48	+1.18	5.64	1883	1.37	1881
<i>Minnesota.</i>									
Minneapolis.....	Hennepin.....	3.46	23	3.06	-0.40	6.21	1879	0.07	1866
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke.....	2.01	19	1.50	-0.51	7.19	1876	0.36	1872
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	3.19	43	1.84	-1.35	7.37	1850	0.55	1852
<i>New Jersey.</i>									
Moorestown.....	Burlington.....	3.88	26	4.59	+0.71	7.38	1867	0.65	1850
South Orange.....	Essex.....	3.03	18	3.25	+0.22	6.46	1888	0.41	1880
<i>New York.</i>									
Cooperstown.....	Otsego.....	3.29	35	3.96	+0.67	7.38	1867	0.36	1879
Palermo.....	Oswego.....	2.66	35	1.17	-1.49	6.90	1867	0.30	1870
<i>North Carolina.</i>									
Lenoir.....	Caldwell.....	4.85	17	6.60	+1.75	11.50	1873	1.60	1881
<i>Ohio.</i>									
N. Lewisburgh.....	Champaign.....	3.81	17	2.75	-1.06	7.95	1882	1.55	1879
Wauseon.....	Fulton.....	3.94	17	8.22	+4.28	8.22	1889	1.14	1877
<i>Oregon.</i>									
Albany.....	Linn.....	2.78	12	3.05	+0.27	5.70	1879	0.89	1884
Eola.....	Polk.....	1.95	19	2.77	+0.82	5.94	1879	0.42	1884
<i>Pennsylvania.</i>									
Dyberry.....	Wayne.....	2.82	19	4.72	+1.90	5.19	1882	0.36	1875
Grampian Hills.....	Clearfield.....	3.77	17	11.60	+7.83	11.60	1889	1.58	1866
Wellsborough.....	Tioga.....	5.20	10	3.45	-0.75	9.36	1884	1.51	1886
<i>South Carolina.</i>									
Statesburgh.....	Sumter.....	3.64	8	3.30	-0.34	6.68	1888	1.24	1882
<i>Tennessee.</i>									
Austin.....	Wilson.....	3.31	21	3.65	+0.34	8.40	1882	1.44	1877
Milan.....	Gibson.....	3.43	6	2.47	-0.96	4.98	1884	1.90	1888
<i>Texas.</i>									
Fort Concho.....	Tom Green.....	2.73	15	2.28	-0.45	9.83	1884	0.00	1876
New Ulm.....	Austin.....	5.86	16	2.52	-3.34	15.25	1884	0.05	1886
<i>Vermont.</i>									
Stratford.....	Orange.....	2.96	16	3.60	+0.64	4.55	1884	0.40	1877
<i>Virginia.</i>									
Bird's Nest.....	Northampton.....	3.64	20	3.75	+0.11	7.85	1885	0.50	1879
<i>Wisconsin.</i>									
Madison.....	Dane.....	3.65	21	3.28	-0.37	8.39	1858	1.09	1870
<i>Washington.</i>									
Fort Townsend.....	Jefferson.....	1.97	15	2.45	+0.48	7.81	1875	0.61	1888

Table of excessive precipitation, May, 1889.

State and station.	Monthly rainfall to inches or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>California.</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	<i>h. m.</i>	
Crescent City.....	10.91					
Grass Valley.....		2.57	5			
Susanville.....		3.45	5			
<i>Colorado.</i>						
Denver (Jesuit College).....				1.15	0 45	28
<i>Dakota.</i>						
Wolsey.....				1.25	1 00	16
<i>District of Columbia.</i>						
Kendall Green.....	10.73	3.12	31			
Washington City.....	10.69	2.98	31			
Washington Barracks.....	10.01					
<i>Florida.</i>						
Jupiter.....				1.15	1 00	28
Tallahassee.....		2.70	30			
<i>Georgia.</i>						
Diamond.....		3.25	29-30			
Gainesville.....		4.75	30			
<i>Illinois.</i>						
Beardstown.....		3.30	28-29			
Philo.....		2.80	28-29			
Rockford.....		2.85	18			
Rock Island Arsenal.....		2.50	17			
Springfield.....		3.30	28-29			
Windsor.....				1.58	1 09	19
White Hall.....	10.63					

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Indiana.						
Angola	Inches.	3.85	28-29			
Butlerville		4.02	29-30			
Huntertown		3.12	29	3.12	3 00	29
Jeffersonville		2.53	30			
Laconia		2.62	29			
Mount Vernon		2.77	28-29			
New Providence		3.27	29-30			
Richmond		2.68	29-30			
Rushville		3.60	30			
Salem		2.60	29			
Spiceland		3.18	29-30			
Vevay		2.50	29-30			
Indian Territory.						
Fort Gibson		2.50	20			
Fort Sill				1.12	0 55	11
Fort Supply				1.63	1 00	28
Iowa.						
Clarinda		2.65	16			
Davenport		2.72	17			
Des Moines		2.50	17			
Fort Madison		2.70	17-18			
Keokuk		2.87	17	1.36	1 10	17
Muscatine		3.50	17			
Kansas.						
Abilene		3.60	16-17			
Atwood		2.50	23			
Conway	11.60	2.70	17			
Do		3.20	28			
Cunningham				1.57	1 10	10
Dwight		2.50	16-17			
Elco		3.10	28			
Ellis		3.50	9-10			
Ellsworth		2.60	10-11			
Fort Leavenworth		2.54	15-16			
Fort Riley		3.32	16-17			
Grainfield		2.75	10-11			
Grisnoll		2.50	27-28			
Haven		3.00	17			
Havensville	10.00					
Hays City		3.25	11-12			
Hoxie		2.50	10			
Junction City		4.09	16-17			
Kanopolis		3.00	10-11			
Lawrence		2.83	12			
Leavenworth		2.51	17	1.02	0 50	10
Lebo	12.14	4.62	28	1.04	0 50	28
Do				1.06	1 00	24
Luray		4.00	12-13			
Manhattan (1)		3.30	16			
Manhattan (2)		3.00	17			
Manhattan (3)		3.47	16-17			
Marmaton		2.80	17			
Morse		3.00	17-18			
Do		2.70	23-24			
Ogallah		3.50	7-8			
Peabody		2.60	28			
Quinter		3.50	28-29			
Russell		2.66	9-10			
Sedan	11.01	3.78	10	2.80	2 30	11
Do		2.80	11			
Vesper		3.00	11-12			
Wakefield		4.25	16-17			
Kentucky.						
Franklin		2.73	28-29			
Louisville		2.99	29-30			
Owenton		3.75	13			
Paducah		2.65	30			
Maryland.						
Baltimore				1.20	1 00	20
Barren Creek Springs		4.12	20	2.25	1 00	20
Do				1.00	1 00	20
Cumberland (1)		3.73	31			
Cumberland (2)		3.75	31			
Fort McHenry	11.98	3.02	21			
Frederick		5.25	31			
Mount Saint Mary's College	10.20	2.86	30			
Woodstock	10.34					
Massachusetts.						
Cambridge		3.10	21			
Michigan.						
Ann Arbor		3.00	29-30			
Adrian		3.57	29			
Berlin		2.98	30			
Detroit		2.57	29-30			
East Tawas		2.50	30			
Fort Wayne		2.90	30			
Noble		3.12	30			
Petersburgh		2.50	30			
Traverse City		2.87	27			
Ypsilanti		2.70	30			
Missouri.						
Booneville		4.42	29			
Frankford		3.44	28-29			
Grand Pass		3.72	28-29			
Hermann		2.62	29			
Kansas City		3.24	17-18			
Kidder						
Louisiana	10.30	2.54	29			
New Frankford	14.35	9.00	28-29			
Do		2.50	17-18			
Princeton		4.40	17-18			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Missouri—Continued.						
Shelbina	Inches. 10.70			Inches.	h. m.	
Wither's Mill		4.00	28-29			
Nebraska.						
Auburn				1.10	0 50	17
New Jersey.						
Locktown		2.85	19-20			
New York.						
Angelica		3.04	31			
Friendship		5.50	30-31			
Humphrey		3.83	31			
Savona		4.56	31			
South Canistota		3.37	30-31			
West Almond		6.00	31			
North Carolina.						
Asheville (1)		3.98	30			
Asheville (2)		4.18	30			
Chapel Hill		4.10	31			
Hatteras		3.06	28	3.06	1.30	28
Lenoir		4.10	29-30			
Marganton		4.95	29-30			
Raleigh		2.79	30-31			
Southern Pines		3.60	31			
Wadesborough		3.50	31			
Weldon (1)		3.44	31			
Weldon (2)		3.25	31			
Ohio.						
Findlay		3.20	30			
Fostoria		3.20	29			
Kenton		2.86	30			
Napoleon		3.10	20	3.10	2.55	20
Wauseon		6.04	29-30			
Pennsylvania.						
Allegheny Arsenal		2.98	10			
Altoona		3.03	31			
Aqueduct		5.70	31			
Blue Knob	10.52	7.90	30-31			
Charlesville	11.07	6.71	31			
Coudersport		5.40	31			
Eagle's Mere		5.17	31			
Emporium		5.85	31			
Germantown				2.28	1.00	21
Grampian Hills	11.60	8.37	31			
Harrisburg		6.16	31			
Holidaysburg		5.12	31			
Huntingdon		4.22	31			
McConnellsburgh	12.41	7.08	31			
New Bloomfield		3.70	31			
Nisbet		3.10	30-31			
Petersburgh		6.60	31			
Pittsburgh		2.96	10-11	1.00	1.00	10
Phillipsburgh		2.83	30-31			
Selin's Grove		6.00	31			
Smethport		5.50	31			
Somerset		4.43	31			
Tipton		3.35	31			
Tuscarora		5.81	30-31			
Wysox		2.90	31			
South Carolina.						
Cheraw		2.80	31			
Florence		4.92	31			
Spartanburgh		3.00	30			
Statesburgh		2.87	30-31			
Tennessee.						
Andersonville		3.15	30			
Chattanooga		2.75	29-30			
Hohenwald		2.75	29			
Jacksonborough		3.44	30			
Kingston		3.52	30			
Kingston Springs		2.80	29			
Nunnally		2.61	29			
Trenton		3.07	29			
Watkins		3.30	29			
Texas.						
Columbia Station		3.07	18			
Corpus Christi		2.68	18			
Fort Worth		2.50	29			
Houston		3.18	18			
La Grange		2.60	17	2.60	1.15	17
Luling		2.53	14			
Palestine				1.50	1.00	17
Vermont.						
Coventry		2.50	20-21			
Virginia.						
Alum Springs		5.50	30-31			
Bolar	10.10	6.25	30-31			
Dale Enterprise	11.70	5.24	30-31	1.10	0.15	12
Fort Myer	11.51	4.86	30-31			
Lynchburgh		2.80	30-31			
Petersburgh		2.78	31			
Smithfield				1.80	0.30	31
University of Virginia		3.00	31			
Wytheville		2.80	30			
Wisconsin.						
Milwaukee				1.16	0.50	17
Mexico.						
Topo Chico				1.20	1.00	20
West Indies.						
Hamilton, Bermuda Island	13.69	2.90	6			
Do		7.07*	22	*Fell	in 20 hours	
Port au Prince (Hayti)	18.30	3.01	11			
Do		3.80	20-20	2.01	1.20	11

Monthly precipitation to equal or exceed ten inches was reported at four stations in central and south-central Pennsylvania, three stations in Maryland, three stations in the District of Columbia, three stations in central and north-central Virginia, one station in west-central Illinois, three stations in central Missouri, four stations in east-central Kansas, and one station in northwestern California. The greatest precipitation for the month, 14.35 inches, was reported at New Frankford, Mo. The voluntary observers at Hamilton, Bermuda, and Port au Prince, Hayti, report monthly precipitation 13.69 and 18.30 inches, respectively. Reports of preceding years show that precipitation to equal or exceed ten inches in May have occurred for the greatest number of years, sixteen, in Texas; for thirteen in Kansas; for ten in Iowa; for from five to nine, inclusive, in Me., N. Y., Pa., Va., N. C., Ga., Fla., Miss., La., Ark., Mo., Ill., Ind., and Nebr.; for from one to four, inclusive, in N. H., Conn., R. I., N. J., Del., Md., D. C., S. C., Ala., Tenn., Ky., Mich., Wis., Minn., Dak., Mont., Ind. T., Colo., and Wash. Ter. In states and territories other than those named reports of ten inches or more of precipitation for May have not been received. The following are notable monthly rainfalls reported for May for preceding years: Melissa, Tex., 34.85 inches in 1881, and 21.95 in 1873; Northport, Mich., 19.85 in 1884; Clarksville, Tex., 19.50 in 1873; Hudson, N. Y., 19.40 in 1876; Houston, Tex., 19.19 in 1883. Exclusive of the instances cited monthly rainfalls for May to exceed fifteen inches have been reported at stations in Arkansas in 1882; in Connecticut in 1854 and 1868; in Kansas in 1877 and 1884; in Louisiana in 1867 and 1873; in Pennsylvania in 1868; in Texas in 1873 and 1884; in Alabama in 1854 and 1882; in Florida in 1857; in Illinois in 1851 and 1872; in Indiana in 1867; in Kentucky in 1858; in Maine in 1850; in New Jersey in 1886; in Ohio in 1869; in Virginia in 1869, and in New Hampshire in 1886.

Rainfall to equal or exceed 2.50 inches in twenty-four hours was reported on a number of dates, and at thirty-five stations in Kansas; on the 10th, 11th, 30th, and 31st, and at twenty-four stations in Pennsylvania; from the 28th to 30th, and at twelve stations in Indiana; from the 28th to 31st, and at eleven stations in North Carolina; on the 17th, 18th, 28th, and 29th, and at ten stations in Missouri; from the 27th to 30th, and at ten stations in Michigan; on the 29th and 30th, and at nine stations in Tennessee; on the 30th and 31st, and at eight stations in Virginia; on several dates, and at six stations in Texas; from the 16th to 18th, and at six stations in Iowa; on the 29th and 30th, and at six stations in Ohio; on the 30th and 31st, and at six stations in New York; on the 20th, 21st, 30th, and 31st, and at six stations in Maryland. In the following-named states excessive rainfall for twenty-four hours was reported at five, or a less number of stations, and on the dates given: Illinois, 17th, 18th, 28th, and 29th; Vermont, 13th, 28th to 30th; New Jersey, 19th, 20th; District of Columbia, 31st; South Carolina, 30th, 31st; Georgia, 29th, 30th; Florida, 30th; California, 5th. In states and territories other than those named rainfall to equal or exceed 2.50 inches in twenty-four hours was not reported. The greatest amount of precipitation on one date, 7.08 inches, was reported at McConnellsburch, Pa., on the 31st. At the following-named stations precipitation to equal or exceed 5.00 inches on one date was reported: Frederick, Md., 5.25, 31st; West Almond, N. Y., 6.00, 31st; Aqueduct, Pa., 5.70, 31st; Charlesville, Pa., 6.71, 31st; Coudersport, Pa., 5.40, 31st; Eagle's Mere, Pa., 5.17, 31st; Emporium, Pa., 5.85, 31st; Harrisburg, Pa., 6.16, 31st; Hollidaysburgh, Pa., 5.12, 31st; Petersburg, Pa., 6.60, 31st; Selin's Grove, Pa., 6.00, 31st; Smethport, Pa., 5.50, 31st. Among the heavier rainfalls noted for two succeeding dates were, 9.00 inches at New Frankford, Mo., 28th and 29th; 5.50 at Friendship, N. Y., 30th and 31st; 7.90 at Blue Knob, Pa., 30th and 31st; 8.37 at Grampian Hills, Pa., 30th and 31st; 5.31 at Tuscarora, Pa., 30th and 31st; 5.50 at Alum Springs, Va., 30th and 31st; 6.25 at Bolar, Va., 30th and 31st; 5.24 at Dale Enterprise, Va., 30th and 31st. At Hamilton, Bermuda, a rain-

fall of 7.07 inches fell in twenty consecutive hours on the 22d, and on the 6th the rainfall amounted to 2.90 inches. At Port au Prince, Hayti, 3.01 inches fell on the 11th, and 3.80 on the 29th and 30th. Reports of preceding years show that precipitation in May to equal or exceed 2.50 inches in twenty-four hours occurs most frequently in the Missouri and upper Mississippi valleys, in Texas, Louisiana, and along the south Atlantic coast, where this amount has been noted for ten or more years. In Florida, the east Gulf states, Dak., Colo., Tenn., Mich., Md., and Pa., for from five to nine years, inclusive, and in Me., Mass., N. Y., Conn., R. I., N. J., Del., Va., Ky., Ohio, Ind., Wis., Minn., and Mont., for from one to four years, inclusive. Over the plateau regions and along the Pacific coast rainfall to equal or exceed 2.50 inches in twenty-four hours has not been reported for May in previous years. Among the heavier daily rainfalls reported for May in preceding years are, 9.92, at Columbus, Ga., 22d, 1880; 9.28, at Durham, Ark., 1st, 1876; 7.60, at Austin, Tex., 30th, 1870; 7.50, at Okolona, Miss., 4th, 1887; 7.37, at Shreveport, La., 6th, 1876. Exclusive of the above, rainfalls to exceed 5.00 inches in one day have been reported for May at stations in Alabama in 1883 and 1885; in Dakota in 1872; in Florida in 1888; in Iowa in 1875; in Louisiana in 1884; in Maryland in 1879; in Minnesota in 1877; in Missouri in 1848; in Nebraska in 1888; in New Jersey in 1878; in North Carolina in 1887; in South Carolina in 1836; in Texas in 1880, 1884, and 1887. The heaviest rainfall ever reported in Pennsylvania for one day in May, for preceding years, was 4.60 inches at Carlisle, 13th, 1868.

Rainfalls of one inch, or more, per hour were reported as follows: Colorado, 28th, one station; Dakota, 16th, one station; Florida, 28th, one station; Illinois, 19th, one station; Indiana, 29th, one station; Indian Territory, 11th and 28th, one station each date; Iowa, 17th, one station; Kansas, 10th, 11th, 17th, 24th, and 28th, two stations on 10th, one station on each of the other dates; Maryland, 20th, three stations; Nebraska, 17th, one station; North Carolina, 28th, one station; Ohio, 20th, one station; Pennsylvania, 10th, 21st, one station on each date; Texas, 17th, two stations; Virginia, 12th and 31st, one station each date; Wisconsin, 17th, one station. In states and territories other than those named rainfall to equal, or exceed, one inch in one hour was not reported. The heaviest rate per minute of precipitation shown by the table is that given for Dale Enterprise, Va., where 1.10 inch fell in fifteen minutes. In May of preceding years rainfalls of one inch, or more, an hour have been most frequently reported in Kansas and Texas, where they have been noted for thirteen and eleven years, respectively: In N. C., S. C., Ga., Fla., Tenn., Ohio, Iowa, Mo., Nebr., for from five to ten years, inclusive; in Vt., Mass., Conn., Pa., Md., Va., Ala., Miss., La., Ark., Ind. T., Ky., Ind., Ill., Mich., Wis., Minn., Dak., Mont., and Colo. for from one to four years, inclusive. In other states and territories rainfalls to equal this amount for the period given have not been reported. Remarkable rainfalls for one hour, or less, have been noted for May in preceding years as follows: Fort McPherson, Nebr., 1.50 inch in five minutes, and 2.25 inches in forty minutes, 27th, 1868; New York City, 1.15 inch in ten minutes, 22d, 1881; Mount Ida, Ark., 1.20 inch in ten minutes, 10th, 1882; Davenport, Iowa, 0.50 inch in ten minutes, 3d, 1888; Collinsville, Ill., 1.70 inch in twelve minutes, 23d, 1888; Toledo, Ohio, 1.10 inch in fifteen minutes, 20th, 1880; Embarras, Wis., 2.30 inches in fifteen minutes, 28th, 1881; Mobile, Ala., 1.64 inch in twenty minutes, 5th, 1879; Fort Riley, Kans., 1.50 inch in twenty minutes, 14th, 1885; West Leavenworth, Kans., 1.50 inch in twenty minutes, 13th, 1886; Palestine, Tex., 1.17 inch in twenty-three minutes, 24th, 1888; College Hill, Ohio, 2.38 inches in thirty minutes, 27th, 1888.

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The following is a record of the heaviest rainfalls during May, 1889, for periods of five and ten minutes, and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—						Maximum rate per minute.
	5 min.	Date.	10 min.	Date.	1 hour.	Date.	
Boston, Mass.	Inch.		Inch.		Inch.		Inch.
Cincinnati, Ohio	.10	20	.15	20	.65	20	.02
Chicago, Ill.	.10	29	.15	29	.45	29	.02
Detroit, Mich.	.08	26	.11	26	.35	26	.016
Dodge City, Kans.	.48	16	.50	16	.60	16	.096
Jupiter, Fla.	.07	27	.12	27	.50	27	.014
New York City	.12	28	.23	28	1.15	28	.024
Philadelphia, Pa.	.07	20	.12	20	.25	20	.014
San Francisco, Cal.					1.00	20	.05
Saint Louis, Mo.	.30	5	.30	5	.40	5	.06
Washington, D. C.	.20	26	.25	26	.30	29	.04
	.25	31	.30	20	.80	20	.05

* During a thunder-storm.

† Fell in twenty minutes.

This table shows that the greatest rate per minute of precipitation for a five-minute period was .096 of an inch at Detroit, Mich., during a thunder-storm on the 16th, and that at San Francisco, Cal., rain fell at the rate of .06 per minute for a five-minute period on the 5th. At Washington, D. C., .05 of an inch per minute was registered for five minutes on the 31st, and at Philadelphia, Pa., this rate was equalled for twenty minutes on the 20th. At Saint Louis, Mo., .20 of an inch fell in five minutes on the 26th, giving a rate per minute of .04 of an inch. The only other stations whose reports appear in the table, giving excessive amounts of rainfall for the periods given, are Boston, Mass.; Cincinnati, Ohio, and Jupiter, Fla., where rain fell at the rate of .02 of an inch per minute for five-minute periods on the 20th, 29th, and 28th, respectively.

SNOW.

Snow was reported on the greatest number of dates, thirteen, in Montana; on eleven in Colorado and Dakota; on eight in Michigan; on six in Oregon and Wyoming; on five in Nevada; on four in California; on three in Illinois, Minnesota, and Utah; on two in Nebraska and Wisconsin, and on one in Kansas, New York, and Pennsylvania. It was reported in the greatest number of states and territories, eight, on the 15th; in seven on the 6th; in six on the 1st, 2d, and 7th; and in from one to five, inclusive, on the 3d to 5th, 8th to 12th, 14th, 16th to 19th, 21st, 22d, 24th, and 28th to 31st.

No snow was reported on the ground at the close of the month.

MONTHLY SNOWFALLS (inches and tenths) MAY, 1889.

Below are given all monthly snowfalls reported:

California.—Cisco, 67; Summit, 63; Emigrant Gap, 50; Truckee, 45; Boca, 39; Fort Bidwell, 7; Dunsmuir, 5; Coles, 2. **Colorado.**—Breckenridge, 46; Georgetown, 39; Palmer Lake, 3.8; Bennet and Fort Collins, 2. **Dakota.**—Fort Buford, 13.5; Carrington, 7.5; Steele and Bismarck, 6; Fort A. Lincoln, 4.5; Napoleon, 1.5; Rapid City, 1.3; Davenport, trace. **Illinois.**—Centralia, Chicago, Flora, Olney, Ottawa, and Richview, trace. **Indiana.**—Huntingburgh, Mount Vernon, and Seymour, trace. **Michigan.**—Kalamazoo and Mottville, 2.5; Lansing, 1.5; Marquette, 0.7; Alpena and Grand Haven, trace. **Minnesota.**—Duluth, 0.5; Brainerd and Farmington, trace. **Montana.**—Fort Custer, 10; Camp Poplar River, 5.4; Fort Logan, 4; Virginia City, 3; Glendive, 1; Fort Keogh, 0.2. **Nebraska.**—Hay Springs, 2; Kimball, 1. **Nevada.**—Wellington, 18; Verdi, 11; Eureka, 10.9; Elko, 10; Tuscarora, 9.5; Pioche, 8.5; Ely, 7.5; Belmont and Virginia City, 6; Lewer's Ranch, 5; Wells, 3.5; Carson City a, 3.2; Mill City, 3; Toano, 2.8; Austin, 2.5; Reno State University, 2.2; Punch Bowl, 2; Carson City b, 1.5; Fort McDermitt and Genoa, 1; Ruby Hill and Winnemucca, trace. **New York.**—Humphrey, 1. **Oregon.**—Siskiyou, 17; Fort Klamath, 6.6. **Utah.**—Fort Douglas, 4. **Wisconsin.**—Fredonia, 1.8; Waucousta, 1; Greenwood, trace. **Wyoming.**—Cheyenne, 14; Fort Bridger, 13.9; Fort D. A. Russell, 3; Forts Laramie and Washakie, 2.0; Camp Pilot Butte, 1; Camp Sheridan, 0.7.

HAIL.

Descriptions of the more severe hail-storms of the month are given under "Local storms." Hail was reported during the month as follows:

1st, Mass., N. C., Oregon. 2d, Md., Oregon. 3d, Mass., N. Y., Tenn. 4th, Me. 5th, Mass., N. Mex., Oregon. 6th, Kans., La., N. C., Va. 7th, Kans., Nebr., Utah. 8th, Cal., Kans., Mich., N. J., Tex. 9th, Ariz., Iowa, Kans. 10th, Ill., Pa. 11th, Ill., Ind. T., Iowa, Kans., Mo., Nebr., N. Y., Ohio, Tex. 12th, Ala., Ill., Ind., Ky., Mo., N. Y., Ohio, Pa., Tenn., Tex., Va. 13th, Ala., Cal., Ga., Idaho, Iowa, Ky., La., Mass., Nev., Oregon, Tex. 14th, Ala., Cal., Dak., D. C., Miss., Nebr., N. C., Va. 15th, Cal., Nev., Oregon. 16th, Ark., Cal., Colo., Dak., Iowa, Kans., Minn., Nebr., Wis., Wyo. 17th, Iowa, Kans., Tex. 18th, Ill., Iowa, Kans., La., Mo., Tex. 19th, Dak., Iowa, N. Y., Wis., Wyo. 20th, Mass., N. Y., Tenn. 21st, Mass., Mont., N. H., N. Mex. 22d, Dak., Va., W. Va. 23d, Ala., Iowa, Kans., Mich., Mo., N. C., Wis. 24th, N. Y., Ohio, S. C., Tenn. 25th, N. Mex., N. C., Ohio, S. C., Tenn. 26th, Conn., Dak., Kans., Tex., Va. 27th, N. Y., Wis. 28th, Cal., Ind. T., Nebr., N. C. 29th, Ind. T., Pa., Tex. 30th, Dak., Mont., Tex. 31st, Wis.

SLEET.

Sleet was reported as follows: 1st, Colo. 5th, Oregon. 7th, Utah. 8th, Nev. 9th, Wyo. 10th, Colo. 15th, Utah. 16th, Colo. 22d, Pa. 28th, Mich. 30th, Mich. 31st, Mich., Wis.

THE JOHNSTOWN FLOOD.*

[By T. RUSSELL, Assistant Professor, Signal Service.]

The rainfall of May 30, 31, and June 1, 1889, in western and central Pennsylvania was unprecedented for that section of country. All the observations of depth of rainfall that could be obtained which were made during those three days are given in the accompanying table, together with the time of beginning and ending of the rain and its duration. The table also includes the adjoining regions in Maryland, the Virginias, Ohio, and New York. The observations comprise those made at the regular Signal Service stations, the river gauge, and special rainfall stations of the Signal Service, and those made by the Pennsylvania and Ohio State Weather Services and by voluntary observers.

These depths of rainfall were plotted on chart v, drawn to a scale of $\frac{1}{100000}$, or about twenty-eight miles to one inch. Lines were drawn through the places having equal depths of rainfall. These lines are shown by the solid black lines for every two inches from two up to ten inches. The dotted lines on the map show the boundaries of the catchment basins of the Susquehanna River, the Potomac River above Washington, and the basin of the Monongahela and Allegheny Rivers above Pittsburgh. The small area about Johnstown, which is the catchment basin of Conemaugh and Paint Creeks, is also shown.

The latter area is also shown on a larger scale, about $\frac{1}{753400}$, or one inch to four miles on chart vii. The small area inside the large one shows the area which drained into the reservoir above the dam on the South Fork, which gave way and caused the disaster at Johnstown. This area is about fifty-two square miles. On this map are shown the depths of rainfall at Blue Knob and Somerset. There is not a single complete observation of rainfall inside of the Johnstown area. The figure, 2.00 inches, given for Johnstown, is only a part of the rainfall. The rain-gauge was carried away by the high water at 10.44 a. m., May 31st. The creek at that time was twenty feet above low water. There was a subsequent observation of the creek at fourteen minutes after 12 o'clock, which reads as follows: "Water higher than ever known; can't give exact measurement."

The dam on the South Fork gave way at 1 p. m., and the city of Johnstown was overwhelmed by the flood at 3 p. m. Mrs. H. M. Ogle, who held the position of Signal Service observer there since November 1, 1884, was lost in the great catastrophe.

The areas between the rainfall lines on chart v were measured with a planimeter, and from these, with the depths of rainfall, the quantity of water that fell was computed.

These quantities are as follows:

* Possible additions and corrections may follow.

Areas of valleys and quantity of rainfall May 30, 31, and June 1, 1889.

Valleys.	Square miles.	Cubic miles of water.
Susquehanna Valley.....	26,070	1.895
Potomac Valley.....	12,050	1.005
Allegheny and Monongahela Valley.....	18,840	0.837
Johnstown Valley.....	628	0.0615
Valley above South Fork Dam.....	52	0.0065

In computing the quantity of rainfall in the Johnstown Valley, given above, it was assumed that the depth of rainfall was 6.2 inches throughout. This is the mean of the observations at the nearest points to the valley—Blue Knob on the east, with a fall of 7.9 inches, and Somerset on the south, with a fall of 4.33 inches.

If the average length of the reservoir was three miles, its width two miles, and its depth forty feet, it would have contained a volume of water equal to 0.045 of a cubic mile. (These dimensions are only approximations.)

All of the rainfall that fell in the drainage basin of the reservoir would only have sufficed to raise its surface 5.3 feet.

The rain lasted about thirty-two hours. Not more than three-fourths of the rainfall (0.0615 of a cubic mile) in the Johnstown Valley had fallen up to 3 o'clock of the 31st. Assuming that nine-tenths of the rainfall reached the streams, only one-tenth being absorbed by the ground, this would leave 0.0414 of a cubic mile, the greatest part of which must have taken considerably longer to flow by Johnstown than the length of time the rain lasted.

On the morning of May 30th the Johnstown river-gauge (7.44 a. m.) read 1.0 foot above low water. On the 31st, at the same time, it read fourteen feet; at 10.44 it read twenty feet.

That part of the river-flow past Johnstown from 3 to 5 p. m. on the 31st (which came simply from the rainfall over the drainage area, leaving out of account the water from the res-

ervoir) may be taken as a part of the whole rainfall proportional to the time. This would give the flow of the river proper for the time, 3 to 5 p. m., as 0.0034 of a cubic mile.

The greater part of the water from the reservoir, equal to about .0450 of a cubic mile, must have passed Johnstown about the same time, from 3 to 5 p. m.

From this it may be inferred that the rainfall-water passing at the time, though great, did not have much significance in causing the disaster, as it was probably not more than one-tenth of that from the reservoir.

This great rainfall, 1.1 of a cubic mile in the Susquehanna Valley and 1.0 cubic mile in the Potomac Valley, occurred to the northeast of a definite low area of barometer, that designated as No. viii. The lowest barometer (29.58) was at Cincinnati at 8 a. m. of the 30th. The 29.6, 29.7, 29.8, and 29.9 inch isobars were regular and the areas they enclosed oblong in shape, with the longer axes running north and south. The region of greatest pressure gradient was to the northwest of the low area on the morning of the 30th. It increased from 29.58 at Cincinnati to 30.38 at Duluth. There was also an increase of pressure toward the northeast. At Halifax it was 30.38. The temperature gradient to the northeast of the low area, the region of heavy rainfall, was also great. The isothermal lines ran from southwest to northeast, and there was a uniform increase in temperature from 40° in the lake region to 70° on the Atlantic coast. It is altogether likely that this great temperature gradient had something to do with the heavy rainfall. The winds in the region of heavy rainfall were from the southeast during the continuance of the storm, and in the lake region, from the northeast.

The broken, black lines on chart vi show the time of the beginning of the rain on May 30th. The times of beginning are not very concordant, but there is a preponderance of observations showing the progress of the rain to be from the Atlantic coast inland, and from the south towards the north.

Table of Observations of Depth of Rainfall.

Station.	Latitude.	Longitude.	May 29.	May 30.	May 31.	June 1.	Total rainfall (May 30 to June 1).	Time of beginning.	Time of ending.	Duration.
Pennsylvania.	°	°	Inches.	Inches.	Inches.	Inches.	Inches.			Hours.
Brookville.....	N. 41 10	W. 79 07	.....	.....	2.41	0.89	3.30	May 30, 1.30 p. m.	June 1, 7.00 a. m.	41 1/2
Clarion.....	41 17	79 26	.....	1.40	1.62	0.01	3.03	May 30, 2.00 p. m.	May 31, 11.00 a. m.	21
Confluence.....	39 45	79 20	.....	.....	1.14	.....	1.14	May 30, 4.30 p. m.	May 31, 7.00 p. m.	26 1/2
Corry.....	41 55	79 37	.....	0.07	0.74	0.34	1.15	May 29, 10.00 p. m.	June 1, ?	.....
Coudersport.....	41 46	78 05	.....	.....	5.40	.....	5.40	May 30, 5.00 p. m.	.....	.....
Edinborough.....	.....	.....	.....	.....	.....	.....	.....	May 30, 6.30 p. m.	May 31, 9.....	.....
Franklin.....	41 25	79 53	.....	0.10	0.81	.....	0.91	May 30.....	May 31.....	.....
Freeport.....	40 42	79 43	.....	.....	1.80	0.05	1.85	May 30, 3.00 p. m.	June 1, 8.00 a. m.	41
Greensburg.....	40 20	79 23	.....	.....	1.70	0.05	1.75	May 30, 6.00 p. m.	June 1, 8.00 a. m.	38
Indiana.....	40 39	79 13	1.20	2.00	1.00	T.	3.00	May 30, 2.00 a. m.	May 31, 7.30 p. m.	.....
Johnstown.....	40 20	79 00	.....	.....	2.00	.....	2.00	.....	.....	.....
Lock No. 4.....	40 10	79 55	.....	.....	1.40	0.02	1.42	May 30, 9.00 p. m.	June 1, 7.00 a. m.	34
Mahoning.....	40 55	79 30	.....	T.	0.64	0.52	1.16	May 30, 6.00 a. m.	June 1, 8.30 a. m.	50 1/2
Oil City.....	41 26	79 42	.....	.....	1.03	0.27	1.30	May 30, 2.30 p. m.	June 2, 9.00 a. m.	.....
Parker's Landing.....	41 10	79 45	.....	.....	1.02	0.14	1.16	May 30, 2.00 p. m.	June 1, 4.00 a. m.	38
Pittsburgh.....	40 27	80 01	T.	1.44	T.	0.00?	1.44	May 30, 4.10 a. m.	.....	.....
Baltzburgh.....	40 18	79 50	.....	.....	1.94	0.02	1.96	May 30, 2.30 p. m.	May 31, 6.00 p. m.	27 1/2
Smethport.....	41 50	78 28	.....	.....	5.50	.....	5.50	May 30, 11.00 p. m.	.....	.....
Somerset.....	40 01	79 07	.....	.....	4.43	.....	4.43	May 30, 10.00 p. m.	May 31, 10.00 a. m.	12
Uniontown.....	39 55	79 44	.....	.....	2.07	0.04	2.11	May 30, 8.30 p. m.	May 31, 8.30 a. m.	12
Warren.....	41 52	79 13	.....	.....	1.76	0.62	2.38	May 30, 6.00 p. m.	May 31, 9.00 p. m.	27
Meadville.....	41 38	80 10	.....	.....	1.35	.....	1.35	.....	.....	.....
Altoona.....	40 31	78 27	.....	.....	3.03	2.30	5.33	May 30, 3.30 p. m.	June 1, 3.30 a. m.	36 1/2
Blue Knob.....	40 20	78 35	.....	T.	7.90	.....	7.90	May 30, 3.20 p. m.	May 31, 9.00 p. m.	29 1/2
Carlisle.....	40 12	77 13	.....	0.05	1.40	1.50	2.95?	May 30, 7.20 a. m.	June 1, early a. m.	28?
Eagle's Mere.....	41 25	76 38	.....	0.36	5.17	.....	5.53	May 30, morning	June 1, 4.10 a. m.	.....
Emporium.....	41 30	78 18	.....	0.12	5.85	.....	5.97	May 30, 9.30 p. m.	May 31, 11.20 p. m.	36? or 32?
Grampian Hills.....	40 58	78 40	.....	0.23	8.37	.....	8.60	May 30, 4.30 p. m.	May 31, 11.20 p. m.	24
Harrisburg.....	40 16	76 54	.....	.....	0.42	7.56	7.98	May 30, 1.35 p. m.	.....	18
Huntingdon.....	40 29	78 03	.....	0.60	4.22	1.75	6.57	May 30, 4.00 p. m.	June 1, 2.00 a. m.	33 or 36
Hollidaysburgh.....	40 27	78 26	.....	2.11	3.99	.....	6.10	May 30, 8.00 p. m.	May 31, 12.00 p. m.	36?
Le Roy.....	41 40	76 48	.....	0.08	2.00	2.36	4.44	May 30, 5.00 p. m.	June 1, 7.00 a. m.	38
Lock Haven.....	41 08	77 31	.....	.....	.....	.....	.....	May 30, 5.00 p. m.	June 1, 2.00 a. m.	31
Nisbet.....	41 13	77 14	.....	.....	3.10	4.00	7.10	May 30, 3.00 p. m.	June 1, 4.00 a. m.	37
Petersburgh.....	40 33	78 05	.....	0.01	6.60	.....	6.61	May 30, 3.00 p. m.	May 31, 11.50 p. m.	33
Philipsburgh.....	40 53	78 17	T.	.....	2.83	3.86	6.69	May 30, 3.50 p. m.	June 1, 5.00 a. m.	37
Selin's Grove.....	40 50	77 55	.....	0.46	6.00	1.07	7.53	May 30, 4.00 p. m.	June 1, 4.00 a. m.	36
State College.....	40 47	77 55	.....	0.75	2.35	1.94	5.04	May 30, 3.45 p. m.	June 1, before dawn	36?
Tipton.....	40 37	78 20	T.	0.80	3.35	.....	4.15	May 30, 4.00 p. m.	June 1, 1.30 a. m.	33 1/2
Erie.....	42 07	80 05	.....	.....	.....	.....	0.72	May 30, 10.00 p. m.	.....	.....
Troy.....	41 47	76 50	.....	.....	.....	3.50	3.50	May 30, 5.00 p. m.	June 1, 4.00 a. m.	35
Wellsborough.....	41 45	77 21	.....	0.65	1.70	7.45	9.80	May 30, 9.15 a. m.	June 1, 4.20 a. m.	31
York.....	39 58	76 41	.....	0.02	1.49	1.70	3.21	May 30, 7.00 p. m.	June 1, 5.00 a. m.	34
Butler.....	40 52	79 55	.....	.....	.....	.....	.....	May 30, 2.00 p. m.	During night 31?	.....
Greenville.....	41 22	80 35	.....	.....	.....	.....	1.22	May 30, evening	.....	.....
New Castle.....	41 02	80 24	.....	.....	.....	.....	2.25	May 30, 3.00 p. m.	June 1, 9.20 p. m.	.....
Charlestown.....	39 55	78 32	.....	0.61	6.71	0.18	7.50	May 30, 4.00 p. m.	May 31, 10.00 p. m.	30
McConnellsburgh.....	39 55	78 01	.....	1.23	7.08	.....	8.31	May 30, 4.00 p. m.	May 31, 12.00 p. m.	32 or 33

Table of Observations of Depth of Rainfall—Continued.

Station.	Latitude.	Longitude.	May 29.	May 30.	May 31.	June 1.	Total rainfall (May 30 to June 1).	Time of beginning.	Time of ending.	Duration.
			Inches.	Inches.	Inches.	Inches.	Inches.			Hours.
<i>Pennsylvania—Continued.</i>										
Catawissa	40 58	76 30					4.81			
Drifton	41 02	75 45		0.44	2.08	0.36	2.88			
Girardville	40 48	76 18					1.54	May 30, 6.00 a. m.	May 31, 12.00 p. m.	30?
Meyerstown	41 51	76 08					1.75			
Lancaster	40 03	76 18		0.23	0.50		0.73	May 30, 2.50 p. m.	May 31, (?)	
Pottstown	40 15	75 38			1.70		1.70	May 31, 6.00 a. m.	May 31, 10.00 p. m.	16
Quakertown	40 26	75 21					0.11	May 31, 6.55 a. m.	May 31, 2.20 p. m.	
Forks of Neshaminy	40 14	75 08		0.04	0.50		0.54	May 30, 11.15 a. m.	May 31, (?)	
Dyberry	41 38	75 18		0.11	0.35		0.46	May 30, 4.00 p. m.	May 30, 6.00 p. m.	
Wysox	41 46	76 27					3.22	May 30, 4.30 p. m.	May 31, during night.	
Reading	40 20	75 55					0.04			
Bethlehem	40 37	75 23					0.02			
Kennett Square	39 51	75 43					0.01			
Coatesville	39 59	75 50					0.01?			
Honesdale	41 35	75 20		0.07	0.50		0.57			
Swarthmore	39 55	75 22					0.09			
Philadelphia	39 57	75 09					0.46			
West Chester	39 57	75 42			0.50		0.50			
Mercersburg	39 49	77 56					1.41?			
Columbus	41 55	79 39					0.81?	May 30, 10.00 p. m.		
New Bloomfield	40 25	77 13					4.07		May 31, later than 9 p. m.	
Point Pleasant	40 25	75 04		0.05	0.46		0.51			
Bedford	40 02	78 31						May 30, 3.00 p. m.		
Chambersburg	39 56	77 42						May 30, 2.00 p. m.		
Bendersville	39 59	77 20						May 30, 3.30 p. m.		
Gettysburg	39 50	77 16						May 30, 3.00 p. m.		
Bellefonte	40 24	77 50						May 30, 5.00 p. m.		
Lewiston	40 36	77 36						May 30, 4.00 p. m.	June 1, 2.00 a. m.	34
Siglerville	40 44	77 34						May 30, 3.00 p. m.	June 1, 1.00 a. m.	34
Yeagerstown	40 38	77 37						May 30, 5.00 p. m.	June 1, 2.00 a. m.	33
Williamsport	41 15	77 04						May 30, 9.00 p. m.		
Ralston	41 37	77 01						May 31, 1.00 a. m.	June 1, noon	32?
Muncy								May 31, 3.00 a. m.	June 1, 1.00 p. m.	36
Frederick	40 17	75 31		0.01			0.01			
Ottsville	40 27	75 09		0.05	0.48		0.53			
Smith's Corner	40 25	75 07		0.05			0.05			
Doylestown	40 17	75 08		0.20			0.20			
Germantown				0.51			0.51			
Marshall's Creek	41 03	75 08		0.10	0.50		0.60			
<i>Virginia.</i>										
Alum Springs	37 50	79 42			5.50		5.50	May 30, 11.30 a. m.	May 31, 7.00 a. m.	19
Bolar	38 15	79 45			6.25		6.25	May 30, 12.00 m.	May 31, 8.00 a. m.	
Lynchburg	37 25	79 09		2.00	0.84		2.84	May 30, 10.45 a. m.	May 31, 4.47 p. m.	18
Fredericksburg	38 18	77 27						May 30, 10.00 p. m.	June 1, 8.00 a. m.	34
Dale Enterprise	38 28	78 53		1.50	3.74		5.24	May 30, 1.30 p. m.	May 31, 6.00 p. m.	16
Norfolk	36 51	76 17		0.26	0.62		0.88			
<i>Maryland.</i>										
Baltimore	39 18	76 37		0.10	2.28	T.	2.38	May 30, 5.30 a. m.		
Washington, D. C.	38 54	77 03		0.58	3.10	0.20?	3.68	May 30, 2.00 p. m.		
Cumberland	39 39	78 45			3.73		3.93?	May 30, 11.59 p. m.	May 31, at night.	
Frederick	39 27	77 22		0.59	5.25		5.84			
Mount Saint Mary's College	39 43	77 12	0.90	2.86	1.92		4.78	May 29, during night.	May 31, 11.30 p. m.	
Fallston	39 31	76 25		0.05	1.25	1.25	2.55	May 30, 7.30 a. m.	June 1, 5.00 a. m.	45
Jewell	38 47	76 34			T.	2.12	2.12	May 31, 9.00 p. m.	June 1, early morning	
McDonough	39 24	76 45		0.05	1.90	1.65	3.60	May 30, evening	May 31, late at night.	
Woodstock	39 19	76 50		0.39	4.69		5.08	May 30, 12.10 p. m.	June 1, 1.00 a. m.	25
<i>West Virginia.</i>										
Buckhannon	38 57	80 16			1.86		1.86	May 31	May 31, during night.	
Clarksburg	39 16	80 22			1.64		1.64	May 30, morning	May 30, during night.	
Egion	39 09	79 37	1.00		3.00	1.00	4.00	May 29, 3.00 p. m.	June 1, 7.00 p. m.	
Kingwood	39 27	79 45						May 30, 1.00 p. m.	June 1, 9.00 a. m.	44
Morgantown	38 30	79 34			1.92	0.03	1.95	May 30, night.	June 1, before 8.00 a. m.	
Pleasant Hill	39 32	79 40						May 30, all day	May 31, all day	
Rivesville	39 30	80 10		0.50	1.50		2.00	May 30, 4.00 p. m.	May 31, 9.00 a. m.	17
Rowlesburg	39 25	79 40			0.55	0.30	0.85	May 30, (?)	June 1, (?)	
Weston	39 00	80 35			0.15		0.15	May 30, afternoon	June 1, morning	
Parkersburg	39 17	81 34			1.48		1.48	May 30, 6.40 a. m.	May 30, 9.10 p. m.	
Charleston	38 25	81 40						May 30, 12 noon	May 31, 11.00 p. m.	36
Piedmont	39 27	79 06						May 30, a. m.	June 1, 1.00 a. m.	37?
Martinsburg	39 28	77 57								
Hinton	39 50	81 00		0.01	1.95		1.96	May 30, a. m.	May 31	
Grand Tower	39 20	77 49					7.25			
Glenville	38 56	80 55		2.15			2.15	May 30, 4.00 p. m.	May 31, 8.00 a. m.	16
Wheeling	40 00	80 40					1.30	May 30, 2.35 p. m.	May 31, before daybreak.	
Catlettsburg, Ky.	38 30	82 37		0.05	0.40		0.45			
<i>New York.</i>										
Albany	43 39	73 45					0.50			
Buffalo	42 53	78 53					1.93	May 30, 8.00 p. m.	May 31, 8.00 p. m.	24
Humphrey	42 12	78 33		0.23	3.83	0.66	4.72	May 30, night.	May 31, night.	24
New York City	40 43	74 00					0.52	May 30, 6.30 a. m.	May 31, 11.35 a. m.	18
Elmira	42 04	76 50		0.37	1.05	1.50	2.92	May 30, 5.30 p. m.	June 1, 7.30 a. m.	38
Factoryville	42 10	76 15		0.10	1.49	1.37	2.96	May 31, 2.30 a. m.	June 1, 11.00 a. m.	44½
Savona	42 37	77 17		0.41	4.56		4.97	May 30, 7.30 p. m.	June 1, 3.30 a. m.	32
South Canisteo	42 13	77 35		0.25	3.12	4.50	7.87	May 30, 6.10 p. m.	June 1, early a. m.	34?
West Almond	42 19	77 55			6.00		6.00			
Rochester	43 08	77 42		0.58	2.34		2.92	May 30, 7.05 p. m.		
Oswego	43 29	76 35		0.01	2.66	0.40	3.07	May 30, 6.35 p. m.	May 31, 11.45 p. m.	29
<i>Ohio.</i>										
Cincinnati	39 06	84 30	1.48	0.10			0.10	May 30, 9.15 p. m.	May 31, 3.00 p. m.	18
Columbus	39 58	83 00	1.06	0.50	0.26		0.76	May 29, 4.55 p. m.	May 31, 1.30 a. m.	
Ellsworth	41 05	80 55		T.	1.30		1.30			
Jefferson	41 44	80 48	0.10	1.44	0.29		1.73			
Lordstown	41 11	80 55	0.12	1.06	T.		1.68			
Orangeville	41 20	80 35	T.		1.25		1.25			
Poland	41 02	80 40	0.10	1.00	0.10		1.10			
Vienna	41 15	80 43	0.04	1.03			1.03			
Youngstown	41 06	80 39	T.	1.03	0.02		1.05			
Demos	40 01	81 04		1.11			1.11			
New Alexandria	40 18	80 45		T.	1.16		1.16			
Salineville	40 39	80 52			2.00		2.00			
Cleveland	41 30	81 45	1.36	0.98			2.34	May 30, 3.15 p. m.		
Gallipolis	38 54	82 16		0.08	0.87		0.95			

* Gauge overflowed.